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COMMITTEE ON THE PEACEFUL
USES OF OUTER SPACE

REPORT ON THE UNITED NATIONS/INTERNATIONAL ASTRONAUTICAL FEDERATION SYMPOSIUM ON BENEFITS OF SPACE TECHNOLOGY FOR THE DEVELOPING WORLD: FROM ECONOMIC GROWTH TO ENVIRONMENTAL PROTECTION

(Israel, 6-9 October 1994)

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INTRODUCTION

A. Background and objectives

1. The General Assembly, by resolution 37/90 of 10 December 1982, endorsed the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82) that the United Nations Programme on Space Applications should promote the growth of indigenous nuclei and an autonomous technological base in space technology in developing countries. At its thirty-seventh session, in June 1993, the Committee on the Peaceful Uses of Outer Space endorsed the United Nations Programme on Space Applications for 1994 as recommended by the Scientific and Technical Subcommittee of the Committee at its thirtieth session. Subsequently, the General Assembly, by resolution 48/39, endorsed the activities of the Programme on Space Applications for 1994.

2. The present report contains a summary of the United Nations/International Astronautical Federation Symposium on Benefits of Space Technology for the Developing World: from Economic Growth to Environmental Protection and the conclusions and recommendations that were adopted by the participants. The full text of the proceedings will be published later. The Symposium was organized as part of the 1994 activities of the Office for Outer Space Affairs and its Programme on Space Applications. The Symposium was the fourth in a series organized by the United Nations and was held in conjunction with the 45th Congress of the International Astronautical Federation (IAF) in Israel. The previous symposia and workshops in this series were held in Canada, United States of America and Austria.

3. The Symposium was held immediately prior to the 1994 IAF Congress in order to enable the funded representatives to also participate in the Congress. The European Space Agency (ESA) and the Commission of the European Communities (CEC) co-sponsored the Symposium, which was hosted by the Israeli National Committee on Space Research (NRSC), on behalf of the Government of Israel.

4. The objective of the Symposium was to present well-established models of space applications and to develop, through working group discussions, general principles on how developing countries could successfully use space technologies, including remote sensing and space communications systems, for environmental protection and for economic and social development. The funded participants were also requested to deliver short presentations on space activities they were involved with in their own countries, and to discuss among themselves ways and means of furthering the applications of space technology.

5. The present report, covering the background, objectives and organization of the Symposium, as well as the conclusions and recommendations adopted by the participants, has been prepared for the Committee on the Peaceful Uses of Outer Space and its Scientific and Technical Subcommittee. Participants will report to the appropriate authorities in their own countries.

B. Organization and programme

6. The following Member States and intergovernmental and international organizations were represented at the Symposium: Brazil, Cameroon, China, Costa Rica, Egypt, India, Mexico, Philippines, Republic of Korea, Senegal, Thailand, Uruguay; ESA, CEC, IAF, International Maritime Satellite Organization (INMARSAT), International Telecommunications Union (ITU) and United Nations Office for Outer Space Affairs (OOSA). Speakers, Chairmen and participants from Austria, Canada, Czech Republic, France, Ireland, Israel, Netherlands, Spain, United Kingdom of Great Britain and Northern Ireland and the United States also attended.

7. Funds allocated by the United Nations, IAF and the co-sponsors for the organization of the Symposium were used to cover the travel costs of funded participants for international air travel, per diem expenses for the period of the Symposium and the IAF Congress, and registration for the Congress.

8. The Symposium was formally opened by J. Grey, President Emeritus of IAF. A welcoming address was also made by N. Jasentuliyana, the Director of the United Nations Office for Outer Space Affairs.

9. The programme of the Workshop (see annex) was jointly developed by the United Nations, IAF and the other co-sponsors. It was designed to provide the participants, through plenary presentations, with knowledge about the various efforts that were being undertaken at the national and international level to provide access for the developing countries to new technologies.

10. Through short presentations, the funded participants provided an overview of the programmes they were involved with in their own countries. The format of the Symposium was designed to provide ample opportunities to discuss ways and means of developing indigenous capabilities in space applications with due regard for the educational, cultural and economic characteristics of the countries concerned.

C. Funded participants in the Symposium

11. Funded participants from developing countries were selected jointly by the co-sponsors of the Symposium from among those who met the qualifications required, one of which was possession of a university degree in one of the fields covered by the programme. Most participants had a technical background. A few key policy makers, at a decision-making level from both national and international entities, were also invited.

12. The latter individuals were selected well in advance of the Symposium and asked to identify within their presentations the key issues that would persuade them to place a higher priority on the operational implementation of space applications. The more technically oriented representatives held positions in institutions or private ventures dealing with resource management, environmental protection, communications, remote sensing systems or industrial and technological development.

13. The co-sponsors of the Symposium provided a daily subsistence allowance to all developing country participants in order to allow more individuals from developing countries to participate in the 45th IAF Congress, which was held from 8 to 15 October 1994 at Jerusalem.

14. At the end of the Symposium, all participants were assigned to a senior IAF member who assisted in guiding the participants through the Congress. The participants expressed their thanks to the United Nations and the other co-sponsors for their financial assistance and for the technical quality of the programme.

I. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

15. The overall direct benefits of space technology for providing alternative solutions in the fields of communications, meteorology, natural resource management and environmental monitoring have significantly altered the perceptions of development in the technologically more advanced countries. However, in many developing countries it still remains a challenge to demonstrate to high-level policy makers the potential benefits, particularly for economic and social development, of utilizing space technology and applications.

16. Explosive population growth, limited land resources, low levels of agricultural activity and poor management of land and water resources have made the task of providing food security to the peoples of the developing countries a formidable challenge. Space technology can contribute to a realistic appreciation of

the problems and to a rapid improvement of agricultural production on a sustainable basis. In this context, the Symposium participants agreed upon the following conclusions and recommendations.

General

1. Policy makers should be shown that the use of space technology can constitute an important element in the overall development policy of their countries.

2. The developing countries, developmental aid and national and international space agencies should discuss ways of expanding cooperation in the field of space technology. National and international space agencies, in particular, should take into account the needs of the developing countries when defining their programmes.

3. Because space offers a wide range of "technology entrances", from relatively low-technology ground segments to actual involvement in satellite production and launch, there are also many opportunities for technology transfer. It is important to note, however, that technology transfer can only be accomplished by cooperation between the developing and industrialized countries, particularly through industrial entities and that the major factor governing such cooperation should be mutual interest.

4. The involvement of local industry in developing countries is an essential requirement for expanding the use of space technology and applications in the developing countries. The participation of local industry can create the momentum needed to stimulate the continuation of programmes and lead to the creation of the necessary infrastructure for fostering technology development and utilization.

5. When altering or modernizing systems for resource management with the goal of improving productivity or environmental quality, special attention should be paid to ensuring that existing methods are well understood. In some developing countries existing resource management systems may have evolved over a long period of time and may be more suited to local conditions than methods adopted in other regions or under different conditions.

6. Training and education should be provided to specialists in order to permit the developing countries to fully benefit from new technologies.

7. Any programme for the promotion of economic growth through the use of space technology should be accompanied by parallel action plans for protecting the environment and for reducing the impact of natural disasters.

8. Developing countries must be assisted and encouraged to adopt a goal-oriented, time-bound and practical approach for the selective application of space technology to solve their basic problems and should be provided with the necessary assistance to achieve the required degree of self-reliance and technical expertise.

Remote sensing

9. Problems related to food supply, environmental degradation and sustainable development are likely to be further exacerbated by population growth which, in absolute terms, is occurring primarily in developing countries. Space-borne remote sensing instruments can provide an adequate tool for overcoming these problems.

10. It was recognized that data from a large number of remote sensing satellites are widely available, and many new satellites are being planned, each of which will provide even more high-quality data. The technology for enhancing, analysing and combining these data is now operational and the cost of systems to perform this analysis continues to decrease.

11. Remote sensing has fully demonstrated its capability to identify wetlands for reclamation, delineate underground water supplies, monitor surface water and soil conditions, provide timely information on crops, and assist in the management of natural disasters such as floods and droughts.

12. National and international space agencies should implement, in cooperation with developing countries, pilot projects to demonstrate to decision makers in those countries the usefulness of Earth observation satellites. Efforts to encourage the sharing of information on successful operational remote sensing programmes should be increased, especially among developing countries.

13. Missions and associated instruments planned by international and national space agencies should be closely scrutinized by the user community in developing countries. This review process should be initiated as soon as possible because many relevant space missions are currently under preparation or in the process of being defined.

14. The space agencies should increase their efforts in the developing countries to promote the operational use of data provided by their systems. This should be done in cooperation with users, the local authorities concerned, the United Nations and CEC, as well as industry. These efforts should include pilot projects, expert visits and enhanced training opportunities.

15. With regard to ongoing and future Earth observation missions, there must be continuity of programmes based on real user needs, continuity in local capacity building efforts (including training of new operators and decision makers) and continuity in the availability of data. There is a strong need for an international network for accessing data from Earth observation satellites.

16. Ongoing research and development into systems that will allow the integration of data from different satellites and other sources, which can be used to predict effects on resources and the environment, should be made available to developing countries. Special attention should be paid to the establishment of ways and means of developing simple to use, low-cost applications.

17. Remote sensing technology and applications are multidisciplinary in nature and require the establishment of an organizational system at the national level to effectively introduce and implement remote sensing applications. Such a system could lead to a wider involvement of users, to the promotion of awareness among decision makers, to training and human resources development and to the development of applications projects in line with local needs.

18. Users should be involved from the early stages of applications development. The effective implementation and operationalization of applications that are relevant to the needs and priorities of each country are essential to success, and these in themselves could strongly influence policy or decision makers to continue to support the programmes.

Telecommunications

19. Satellite broadcasting, as illustrated by numerous examples, can serve as an important catalyst and motivator in the development process, particularly in rural and remote areas.

Emerging technologies hold great promise for meeting the needs of developing countries for improved education and training.

20. Opportunities should be sought for joint ventures between companies from the industrialized countries and those in the developing countries. Such joint ventures should offer the developing countries a fair share of ownership and the clear potential for expansion and growth of space capabilities. Education and training mechanisms should encourage and facilitate the transfer of outside expertise in the technologies, particularly the operation and use of space systems (including ground-based equipment) to personnel in developing countries.

21. It is realistic to assume that the financial resources for extending communications to remote and rural areas are available. The bottom line, however, is that it requires initiative and some entrepreneurial activity from within Governments, public telecommunications providers or from other service providers, who recognize the value of getting involved in and profiting from the telecommunications business.

22. Among the technologies currently available for delivery of services to remote and rural areas, some are more cost-effective than others. There is, however, no single solution and, depending upon the particular situation, a variety of technologies should be applied. Developing countries should also adopt policies and regulations that would facilitate the availability of telecommunication services in remote and rural areas.

23. Developing countries need to enhance their capabilities in systems planning, and the operation and maintenance of the ground segment of space-based broadcasting systems. Aspects such as access to television and providing the appropriate feedback mechanisms, should be taken into account at the planning stage itself so that the full benefits of satellite broadcasting can be derived. Addressing regional problems in local languages requires the involvement of local people in systems planning and software production.

II. PRESENTATIONS TO THE SYMPOSIUM

17. The presentations focused on the problems faced by the developing countries that could be solved through the use of space technology. The main emphasis of the presentations was to highlight general principles on how developing countries could successfully use space technologies, including remote sensing and space communication systems, for environmental protection and for economic and social development.

18. It was noted that the use of space data requires mechanisms and organizations in the country concerned to ensure its proper dissemination and utilization. The experience of a number of countries has indicated that this is no easy matter.

19. It was repeatedly emphasized that depending on the actual situation, needs and resources in a particular country, space technology can, if properly used, lead to faster economic growth and stronger overall development. This requires that all countries be provided with access to the information and technology needed to participate in various space applications so as to derive the benefits of space technology.

20. In addition, it was mentioned that concrete and practical benefits of space emerged mainly from end-to-end application projects. Thus, the real benefits from a remote sensing system or a telecommunication satellite do not merely come from constructing and launching the system or collecting and receiving data, nor from solely processing and analysing the data. Rather, the practical benefits come only after the analysed

data are given to the user and actually used in resource management, health care, cartography, agriculture, education, or other applications areas.

21. Participants stated that understanding the natural environment and its relationship with ecological processes is a prerequisite for undertaking any developmental planning anywhere in the world. While humanity's dependence on the environment is greater than that of other organisms, its pursuit of progress has caused tremendous stress on the environment.

22. It was noted that if the present trends of economic growth continue to depend on expanded use of fossil fuels, the quantitative effect of global warming will undoubtedly result in a change of climate, depletion of ozone levels, an increase in sea levels and ultimately lead to an ecological disaster affecting the whole world.

23. It was reiterated that space technology can play a key role in the monitoring of these changes and in the development of strategies to counteract current trends. Closer cooperative links should be established among the developing countries themselves as well as between industry in the developed and developing countries.

Remote sensing

24. The benefits of remote sensing data for providing repetitive, synoptic coverage of large areas across various spatial scales was mentioned. It was stated that remote sensing can be a highly cost-effective technology for managing natural resources and that data from a number of satellites are now available to every country. These data can provide valuable information for resource assessment and can be a valuable aid in making decisions related to resource management.

25. In deciding between the use of satellite remote sensing versus aircraft or conventional ground techniques it was stated that cost-effective, extensive and repetitive coverage of the surface of the Earth can only be provided by satellite systems. These data can then be integrated into geographical information systems (GIS) which are designed to use a large variety of spatial data, and to efficiently store, manipulate, analyse and display these data according to user-defined specifications.

26. It was stated that the use of Earth observation techniques in the developing countries must take into account special conditions which are not necessarily relevant elsewhere. Before implementing operational remote sensing programmes, the lack of conventional data, urgency of environmental and humanitarian problems, generally poor infrastructure and absence of trained personnel must be addressed. Remote sensing, as helpful as it can be for a variety of applications, has therefore only emerged slowly in the developing countries, and it is important to understand the key factors for successful implementation of remote sensing technology and the extent to which they are specific to the regions concerned.

27. Remote sensing is a cost-efficient tool for confronting some of the many problems currently faced by the developing world and an essential element in national, regional and international planning efforts to implement programmes based on the concept of sustainable development. Remote sensing programmes can help countries to use their resources more efficiently, while safeguarding the environment for current and future generations.

Telecommunications

28. Presentations on telecommunications focused on issues of rural and remote area communications and the imbalances between developed and developing countries in educational advancement. For developing countries, it is clear that illiteracy can be eradicated only through the rapid expansion of education, which forms the first essential step in any action aimed at improving living conditions.

29. Traditional educational methods are clearly insufficient for achieving the educational goals of many developing countries. Space technology, however, has provided new mechanisms for countries to meet those goals. For example, distance education through the use of satellites, which is capable of reaching wide audiences at various educational levels, can provide learning opportunities at costs that are lower than traditional education methods and represents a potential solution to the problem of illiteracy.

30. Several countries have recognized the potential of satellite-based television broadcasting as a medium for mass communication and education and have developed a high level of expertise in space communications for educational applications. New distance education systems use multi-media, including television, video cassette recorders and printed materials to form a comprehensive learning package. Satellite telecommunications can serve as a vital vehicle for distance education and deliver services at reduced rates as experiences in China, India and Indonesia have shown.

31. It was reiterated that throughout the world very little economic and social growth can take place without an adequate telecommunications infrastructure. Many countries have recognized this and have begun to invest in the necessary infrastructure, in both urban and rural areas, to take advantage of new technologies. This has helped to slow migration to some urban areas, which is a central policy goal in many developing countries. It was also noted, however, that in many cases the extension of microwave towers, fibre optic cable or even copper wire-based systems to remote and rural areas is simply beyond the financial capabilities of many developing countries.

32. It is in these cases where satellite-based systems can be vital due to their ability to deliver services anywhere in the world at any time. It is important to understand that a large percentage of the future market for such systems, especially with the advent of personal satellite communications, will be in the developing countries, and that the rapid development of new communication technologies throughout the world will be closely related to increased international cooperation.

Annex

PROGRAMME OF THE SYMPOSIUM

DATE/TIME	SUBJECT	SPEAKER
6 OCTOBER 1994		
08.30-09.00	Registration	
	Plenary session	
09.00-09.40	Opening	United Nations/IAF, Israel
09.40-10.10	Keynote address: Space cooperation - paving the way for social, economic and environmental security in the 21st century	J. Grey (United States)
10.10-10.30	Break	
10.30-11.00	Benefits from space technology - cooperating with the developing world	J. Arets (ESA)
11.00-11.30	Use of space technology for food security	U. R. Rao (India)
11.30-12.00	Use of space technology in protecting the Earth environment	J. P. Malingreau (CEC)
12.00-12.30	Discussion	
12.30-14.30	Lunch	
14.30-15.00	Space education and training in the developing countries	C. Hoffmann (United Nations)
15.00-15.30	Opportunities and problems in deriving the maximum benefits from the use of satellite data in Africa	D. Mabi (Cameroon)
15.30-16.00	Accessing data obtained by satellites - establishing an international network	S. Vibulsresth (Thailand)
16.00-16.15	Break	
16.15-17.30	Discussion	

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Remote sensing for a better understanding of the environment

09.00-09.30	Prospects for the continuity of satellite image data for sustainable development and environmental protection	G. Jensen (ESA)
09.30-10.00	Remote sensing for monitoring desertification and droughts	A. Karnieli (Israel)
10.00-10.10	Break	
10.10-10.40	Cooperating with the industrializing world	F. Jansen (Netherlands)
10.40-11.10	The industrialized world - aspects of cooperation	R. Mucio (Brazil)
11.10-12.00	Discussion	
12.00-13.00	Lunch	

Rural communication

13.00-13.30	Delivery of mobile satellite services to rural areas	D. Wright (INMARSAT)
13.30-14.00	Satellite broadcasting for the benefit of rural and remote areas	K. Narayanan (India)
14.00-14.10	Break	
14.10-14.40	Satellite communications for mass education	L. Dingsheng (China)
14.40-15.10	Establishing favourable tariffs - the Indonesian experience	D. Hendrojono (Indonesia)
15.10-16.00	Discussion	

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Closed working group meeting

Global change

09.00-09.20	Earth observation and global change - the European perspective	J. P. Malingreau (CEC)

09.20-09.40	The role of developing countries in global change	A. Setzer (Brazil)
09.40-10.00	Discussion	
	Presentations of funded participants	
10.00-12.00	Brief presentations by selected participants	
12.00-12.30	General discussion	
12.30-14.00	Lunch	
	Report preparations	
14.00-17.00	General discussion and preparation of draft recommendations	

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	Plenary session	
10.00-10.30	Chairmen present the report	
10.30-11.30	General discussion on recommendations	
11.30-12.30	Adoption of report and closing ceremony	